Bi-chalcogenides films grown by physical vapor deposition technique

Guarino A[1,*], Arumugam R[1], Castrucci P[2], Loudhaief N[2], Campagna E[2], Fittipaldi R[1], Balakrishnan G[3], Matteo Salvato[2], Vecchione A[1].
*lead presenter: anita.guarino@spin.cnr.it
1 CNR-SPIN Salerno c/o University of Salerno, via Giovanni Paolo II 132, Fisciano, Italy
2 Università degli Studi di Roma "Tor Vergata" via della Ricerca Scientifica 1, Roma, Italy
3 Department of Physics, University of Warwick, Coventry CV4 7AL, United Kingdom

During the last years, Bi-chalcogenides compounds have attracted the scientists' interest due to their topological insulator properties [1] as well as their plethora of applications in several fields such as spintronics, superconducting quantum computing [2], optoelectronics [3], energy storage technology [4], pharmacology [5]. In particular, thanks to their small electronic bandgap, Infra-Red photodetectors can be obtained by depositing topological insulators films on Si-doped substrates. In this context, a physical vapor deposition procedure has been optimized to grow Bi_2Te_3 and Bi_2Se_3 films on different substrates at temperatures below 100 °C, relevant for flexible electronics and for integrated photodetector devices. The process is rapid and cheap and allows to fabricate films with different thicknesses, down to a single layer. A systematic characterization is performed on different sets of samples to study homogeneity, stoichiometry, and crystalline quality of the samples.

References

[1] Majhi K et al. Emergence of a weak topological insulator from the Bi_xSe_y family Appl. Phys. Lett. 2017; 110; 162102-1-162102-5.
[2] Moore E et al. The birth of topological insulators Nature 2010; 464; 194-198.
[3] Wang F et al. Submillimeter 2D Bi2Se3 Flakes toward High-Performance Infrared Photodetection at Optical Communication Wavelength Adv. Funct. Mater., 2018, 28, 1802707-1-1802707-10.
[4] Chang C B et al. Recent Progress on Sb- and Bi-based Chalcogenide Anodes for Potassium-Ion Batteries Chem Asian J. 2022; 17; e202200170-1-e202200170-18.
[5] Huang J et al. Emerging Bismuth Chalcogenides Based Nanodrugs for Cancer Radiotherapy Nanodrugs for Cancer Radiotherapy 2022; 13; 844037-1-844037-8.